

Agency problems in structured finance –
a case study of European CLOs



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Agency problems in structured finance - a case study of European CLOs

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Abstract

This paper is a case study that focuses on possible incentive problems in the management of Collateralized Loan Obligations (CLOs). CLOs are the most important type of special purpose vehicles in the leveraged loan market, and their managers appear to have a considerable impact on performance. Specifically, this article identifies the potential incentive, or agency, problems facing CLO managers, and the mechanisms that have been put in place to mitigate these problems. These mechanisms, including structural provisions, financial incentives and reputational concerns, should work fairly effectively. However, the analysis reveals some gaps which may allow managers to engage in certain adverse strategies. Specifically, the article raises concerns about the reliability of constraints on overall portfolio risk, the so-called portfolio tests, and about the effectiveness of reputation as a disciplining device. Both concerns are related to the benign market conditions until the summer of 2007 which – at least until now – prevented, any “stress-testing” of CLOs and differentiation between managers. This paper analyzes also evidence on CLO transactions in which managers buy/hold a portion of the equity tranche. Although retention of the equity tranche is only one of several incentive aligning mechanisms and not a general requirement, the analysis reveals that factors related to the agency problems can explain why in certain cases managers buy/hold a portion of the equity tranche. Specifically, first time managers and managers of a risky transaction buy/hold more frequently a portion of the equity tranche. Furthermore, buy/hold patterns change over time, which suggest that competitive effects and market trends play a role in the question whether to retain a portion of the equity tranche.

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1. INTRODUCTION

The current turmoil in credit markets, which originated with problems involving securitisations of U.S. subprime mortgages but which quickly spread to the global financial system, has called into question the desirability of securitisation and the viability of the "originate-and-distribute model" of banking. Since securitisation and the widespread use of off-balance sheet vehicles were related to the diffusion of the crisis, market participants quickly suspected that the securitisation process was fundamentally flawed and that participants along the various links of the securitisation chain had adverse incentives. For example, originators and transaction arrangers who did not retain a portion of the securitisation transaction on their balance sheets may have had less interest in screening borrowers or in monitoring the quality of the securitised loans. This suggests that although the crisis originated in the U.S. subprime segment, imprudent behaviour may also have occurred in other segments and asset classes used in securitisation or structured finance transactions, such as leveraged loans, which experienced a boom in recent years similar to that of the subprime market.

One potential problem in leveraged loan securitisations involves the management of the special purpose vehicles that are created in the course of securitisation and structured finance transactions. The most important types of vehicles in the leveraged loan market are collateralized loan obligations (CLOs). CLOs are in fact Collateralized Debt obligations (CDOs) that invest almost exclusively in leveraged loans.¹ The manager of a CLO builds and manages a portfolio of around 100-200 leveraged loans on behalf of different types of investors. CLOs are structured by tranching, e.g. they issue securities with different risk/reward profile for different investor groups against the collateral pool. CLO managers make a profit by exploiting the excess spread between the interest proceeds of the collateral and the interest to be paid on the issued securities. Because CLOs are often actively managed and the managers appear to have a considerable impact on performance (See S&P, 2002b, Fitch, 2006), a concern is that the transaction managers may not have the incentive to act in the best interest of all the investors.

This article analyzes the potential incentive, or agency, problems facing CLO managers and the mechanisms, or constraints, that are put in place to mitigate these problems.² The analysis reveals that CLO managers may engage in adverse strategies related to the build-up of the portfolio, ongoing loan trading decisions and to the treatment of impaired loans (work-out decisions). Structural and portfolio provisions, the financial remuneration of running a CLO and reputational concerns should constrain the manager in pursuing such strategies. The article argues that such constraints should work fairly effectively, but identifies some gaps which may allow managers to engage in adverse strategies. It also analyses evidence on CLO transactions in which the manager buys/holds a portion of the equity tranche. Although retention of the equity tranche is only one mechanism to alleviate the agency problem (as part of the financial remuneration of running a CLO) and hence not generally required, managers frequently buy/hold a portion of the equity tranche. The analysis reveals that factors which are related to the agency problems have an impact on whether a manager buys/holds or not a portion of the equity tranche of a specific CLO transaction. Specifically, managers retain more often a portion of the equity tranche when they are first-time managers or when the transaction

¹ CDOs are vehicles that may invest in a wide range of fixed income assets, including mortgage backed securities, structured finance securities, or loans and bonds.

² Agency problems may also face other participants in the loan securitisation process such as originators, arrangers, trustees or rating agencies. However, the agency problem facing managers in CLOs appears to be the main concern because the tasks of the other participants are relatively more standardized and more easily verifiable by the counterparty and hence less susceptible to agency problems.

involves a higher level of risk. Furthermore, competitive effects and the passage of time play a role: the results show that the share of CLO transactions where the manager buys/holds a portion of the equity tranche has decreased over time, pointing to a possible deterioration of lending standards in the market. This result supports a finding of the article that the way how agency problems are dealt with is in certain cases subject to market trends.

The article proceeds as follows. Section 2 identifies the potential agency problems in the management of CLOs. Section 3 discusses how such problems may materialize in the management of a CLO. Section 4 uses presale reports and prospectuses of European CLOs to examine the structure of CLO transactions and the mechanisms intended to reduce the agency problem. Section 5 discusses how the constraints affect the strategies identified in section 3. Section 6 concludes.

1. AGENCY PROBLEMS IN CLO MANAGEMENT

Considering the degree of freedom for managers, the question for their incentives arises naturally. It is well known that incentive conflicts and agency problems play an important role in the management of modern corporations and banks - but do they also apply to the case of CLO management? It is instructive to recall first the nature of agency problems in corporations and banks before discussing their role in CLO management.

1.1. A BRIEF EXPLANATION OF THE AGENCY PROBLEM

According to the Berle and Means (1932) tradition, a fundamental source of agency problems in firms is the separation of ownership and control. The owners of capital do not usually run the business they finance or the banks to which they trust their money themselves but leave it up to agents (managers) to maximize returns on their investment. This gives rise to conflicts of interest and diverging objectives between the agent and the capital owners (investors). Ultimately, the incentives of the managers and possible conflicts of interest depend on the precise nature of the (financial) contracts that govern the relationship between managers and the owners, as well as on the firm's financial structure. The types of contracts that underlie the financial structure in modern corporations are equity and debt. Equity contracts assign residual profits to equity holders, who are thus residual claimants, and also give them the formal control over the firm's assets. Debt contracts specify fixed payments to the debt holders and assign only contingent control rights, which are typically triggered upon default on the fixed payments. Since manager are responsible for control in modern corporations, there is a triangular agency relationship between the manager and the two types of investors - those with residual claims (equity holders) and those with fixed claims (debt holders). As described by Jensen and Meckling (1976), both equity and debt financing generate specific agency problems. The agency costs associated with equity are managerial slack; while the agency costs associated with debt financing represents risk shifting (asset substitution):

- **Managerial slack.** A manager will only have weak incentives to exert effort and to increase the value of a business if he does not fully reap the profits he generates but only receives a share of them. This problem usually occurs in the presence of equity investors, as they are residual claimants and "cash in" on (most of) the profits. For example, a manager may devote less effort to screening the risk of a loan or to monitoring loans, as the benefit of such efforts will accrue mostly to equity holders.
- **Risk shifting (asset substitution).** Due to their different financial claims, equity holders and debt holders have a different view with respect to risk taking. This can be illustrated by considering an increase in the volatility of a business, which is equivalent to a simultaneous increase of the upside- and downside risk. Equity holders benefit from such an increase, as they cash in fully on the higher profits associated with the higher upside risk, but do not incur

the additional losses from realizations of the greater downside risk when the firm's revenues are so low that claims of debt holders cannot be met. By contrast, due to the fixed nature of their claims, debt holders do not gain from the increase in the upside risk but may recover less due to the realizations of downside risk when the firm's revenues do not fully cover their fixed claims. Hence, equity holders prefer strategies involving a higher degree of risk than is generally desirable. Managers, too, may benefit from the "extra" upside more than they suffer from the "extra" downside and hence might pursue excessively risky strategies. Note that the magnitude of the risk shifting problem depends on the likelihood of default. When the firm or bank is well capitalised and default is remote, the risk shifting problem is of less concern, whereas it becomes more important when the likelihood of default is high.

Thus, managerial slack denotes the case where a manager fails to maximize the value of a firm or portfolio, while risk shifting denotes the case where the manager accepts an inefficient high level of risk in his efforts to maximize the value of a firm or portfolio. Both problems may occur simultaneously.

1.2. THE AGENCY PROBLEMS IN CLOS

Which role do risk shifting and managerial slack play in CLO management? At first sight, CLOs resemble firms in many aspects: They are run by managers who act on behalf of the investors; and the investors have debt- and equity-like financial claims in the CLO.³ However, some idiosyncrasies are worth discussing.

First, the overall degree of manager discretion is lower in CLO management than in firms. CLOs have a finite lifetime and a clearly defined purpose, while banks and firms are ongoing concerns with infinite lifetime which can embark on a wide variety of projects. Hence, one cannot take the presence of agency problems in CLO management for granted - they can only arise in dimensions in which the managers have discretion and do not merely follow a predefined algorithm. As will be shown in the next section, there exists considerable discretion for CLO managers, though.⁴

Second, while the senior tranche investors have similar claims as debt holders have in banks and firms (they usually have the right to vote on the course of action when the CLO experiences and event of default), the characteristics of the equity differs. The holder of the CLO's equity tranches are residual claimants of profits and hence participate in the upside risk (i.e. excess spread) as equity holders of a firm, but unlike equity holders of banks/firms they do not have the formal right to make decisions. However, the equity tranche holders may call-in a CLO after a predetermined period (the non-call period) by majority voting provided no covenant tests are breached. The equity tranche investors may want to do so to lock in profits or to exit an expensive CLO structure (S&P, 2008). While it is natural to see that bank/firms managers' incentives are aligned with equity holders' interest as the former exert control as agents of the latter, it is *a priori* not entirely clear whose interest CLO managers should serve in normal times. As will be explained below, the remuneration scheme, a possible ownership of the equity tranche and reputational concerns have a strong impact on managers' incentives to serve the different investor groups.

³ CLOs issue usually more than two different tranches (i.e. senior tranches, mezzanine tranches, equity tranches). For ease of exposition, this paper considers only two classes of tranches, senior tranches (debt) and equity tranches (equity). However, the message carries over to the case of several tranches with different risk profile.

⁴ The question of why some actions are contractually pre-specified and others left to the managers' discretion lies beyond the scope of this paper. In brief, there are costs and benefits of specifying actions in a contract. Depending on their relative level, it may or may not be optimal to leave some actions to the discretion of a party which is then the owner of residual control rights. These questions are part of the 'property rights theory' and are studied in the general context of the theory and boundaries of firms. See Hart (1988), Grossman and Hart (1986) and Hart and Moore (1990).

Third, the scope for risk shifting in CLOs is subject to debate. Risk shifting incentives increase in leverage, as the equity holders have more to gain from increasing risk when debtholders take a higher proportion of the downside. In principle, regulation may then be used to mitigate risk shifting incentives. CLOs have a relatively high (around ten) leverage, which implies that risk shifting incentives can be important. This makes CLOs more akin to banks than to firms. However, banks are regulated, while CLOs are only constrained by third parties such as credit rating agencies ("delegated regulation"). Assuming that delegated regulation is less effective than direct regulation, risk shifting should play a larger role in CLOs than in banks. With respect to regulatory discipline, CLOs thus resembles firms which are also not directly regulated. However, firms usually have limited incentives to shift risk due to low leverage, despite of the fact that they have a large upside of increasing risk (e.g. investment in radical innovations which may earn high profits). The upside (e.g. increasing excess spreads) is likely to be limited in CLOs due to the fixed income nature of the collateral, but CLO managers may also use other ways to 'shift risk' by e.g. diverting payments from senior to equity tranche holders as explained below. To sum up, risk shifting incentives seem to matter in CLO management, but their degree relative to firms is somewhat subject to debate.

Overall, it can be concluded that the two broad types of agency problems, managerial slack and risk shifting, still apply in the case of CLOs. This is because the triangular relationship between managers, investors with equity-like claims and with debt-like claims is still intact.

2. SIGNS OF AGENCY PROBLEMS IN CLO MANAGEMENT

The dimensions in which CLO managers enjoy discretion can be broadly grouped into two categories: a) loan sourcing and trading and b) treatment of impaired loans.⁵ In the following, the specific strategies within each category are highlighted.

2.1. LOAN SOURCING AND TRADING

The main activity of a CLO manager is to buy collateral. This is important both during the time in which the manager fills the portfolio (the ramp-up period) and during the time in which the manager can re-invest proceeds and trade loans (the reinvestment period). The ramp-up period represents the first challenge to the CLO manager. Typically, a CLO manager has acquired only 40%-70% of the target portfolio size at closure date when investors commit funds, and must fill the rest of the portfolio during the ramp-up period, which typically last between 6 and 12 months. Once the target portfolio size is reached, the CLO becomes effective and the CLO enters the reinvestment period, which usually lasts between 5 and 7 years. In this period, the CLO manager can trade credit improved and impaired loans, but also loans on a discretionary basis for up to 20% of the par amount of the portfolio per annum. CLO manager must also constantly re-invest proceeds from loan repayments which sometimes reach 50% of the portfolio per year (S&P, European CDOs of Leveraged Loans Q2 2007 Review). After the reinvestment period, the manager is usually restricted to replacing impaired loans and unscheduled proceed from re-payments with loans of higher quality and shorter maturity. Since there is little to scope to increase returns after the reinvestment period, a manager usually calls in the CLO by redeeming proceeds to investors at or shortly after the end of this period (the legal lifetime of a CLO is around 15 years).

⁵ The focus is here on cash flow CLOs. The agency problems identified in such CLOs do not necessarily carry over to the case of synthetic CLOs. For instance, the ramp-up is not an issue in synthetic CLOs, as the manager can instantly buy credit default swaps (CDS) and is not restricted to loan issuances.

To be more specific, a CLO manager might use several adverse strategies related to loan sourcing and trading. Both risk shifting incentives and managerial slack motivate such strategies:

- **Concentrating risk.** The CLO manager may seek to build up a portfolio with high risk concentration, such as selecting loans with high default correlation. A highly risk-concentrated portfolio either performs very well or very bad and therefore exhibits a higher volatility than a risk-diversified portfolio. As explained above, such a strategy benefits equity tranche holders but harms senior tranche holders. This strategy is thus purely risk shifting.
- **Buying (selling) loans below (above) par.** A CLO manager may want to buy loans below par to re-distribute the unused proceeds to equity tranche holders or to pay out realized gains from selling a loan above par to equity tranche holders rather than trapping the proceeds inside the portfolio to increase overcollateralization for senior tranche holders. Since the par amount of the portfolio to the liabilities outstanding is an important benchmark of portfolio quality, such a strategy might be used to extract surplus for equity tranche holders while preserving benchmark tests with respect to the portfolio par value (See S&P, 2002a). In the case where a price below par reflects higher credit risk, such a strategy increases the credit risk of the portfolio.⁶ This strategy represents risk shifting, as equity tranche holders gain at the expense of senior tranche holders.
- **Buying subordinated or lower rated loans.** A CLO manager might also seek to invest in subordinated or lower rated loans to earn higher yields. A potential concern is that, while increasing the ability of the CLO manager to meet the regular interest payments on tranches, it also increases credit risk of the portfolio. Such a strategy represents risk shifting, since the manager can realize higher returns for equity tranche holders when economic conditions do not deteriorate.
- **'Buying the market' and insufficient credit analysis.** The CLO manager might spend little effort to screen loans and to conduct a proper credit analysis but simply buy whatever is available ('buying the market'). For instance, a CLO manager might simply rely on public information to evaluate loans instead of private information obtained through meetings with the borrower. The adverse effects of such a strategy tends to be higher in the case of loans of smaller, less intensively monitored borrowers where the degree of uncertainty regarding the latter's creditworthiness is greater (See S&P, 2002a). Similarly, a CLO manager may also have little incentives to screen loans when he is the subsidiary of an originator of loans, e.g. a private equity firm or a bank with a leveraged loan department. Then, the manager might be inclined towards simply sourcing loans from the parent even when they do not meet high credit standards, or offload weak loans from the balance sheet to the CLO.⁷ Such strategies are harming both senior and equity tranche investors, as the higher risk of such inferior loans is not compensated by higher expected returns. This is managerial slack.

2.2. TREATMENT OF IMPAIRED LOANS

CLO managers must also make decisions with respect to impaired loans. Principally, managers have different options for dealing with impaired loans. They might sell them in the secondary market, but they may also hold on and go through a workout process in the event of default. Going through a

⁶ Note that there are also factors that may drive down loan prices below par, such as elevated liquidity risk.

⁷ The focus is here on arbitrage CLOs and not on balance sheet CLOs. The former are set up to realize profit opportunities, while the latter are set up to offload loans from the balance sheet. Therefore, concerns about adverse loan selection are much lower for arbitrage CLOs than for balance sheet CLOs. However, they may also play a (minor) role in arbitrage CLOs when the managers uses also "own" loans to fill the portfolio.

workout, however, necessitates a certain set of capabilities. A further issue for managers is then their willingness in the first place to acquire such skills or not. Managers may specialize on a buy and sell strategy, relying on a functioning secondary market throughout the credit cycle (or overall benign conditions) or on a buy and hold strategy with eventually workouts. Thus, there is a concern for the following adverse strategies:

- **Trade-off selling vs. work-out.** The decision whether to go through a work-out or to sell loans involves a trade-off for investors: selling an impaired loan reduces par amount of portfolio and available proceeds, but lowers credit risk of portfolio. By keeping an impaired loan in the portfolio, the manager keeps the credit risk in the portfolio but there is the chance that the loan improves. This trade-off might be solved differently by equity and senior tranche investors and bears therefore potential for conflict between the investor groups and hence risk shifting.
- **Investment in work-out capabilities.** An indirect effect arises from the investment decision of CLOs manager in work-out capabilities in the first instance. CLO managers with dedicated work-out capabilities can more likely realize the economic value of an impaired loan (even when the secondary leveraged loan market is dislocated), while a CLO managers without workout capabilities would be more likely to realize an inefficiently low recovery rate on its own and is hence would be more willing to sell an impaired loan in the secondary market even at very low prices. Hence, a viable strategy for CLO managers might be to gamble on low default rates and save on work-out capabilities. In the event of high default rates, the manager lacks the appropriate skills and will likely realize a low price from selling an impaired loan or going through a workout himself. This strategy resembles both risk shifting and managerial slack. It represents managerial slack, as it allows the CLO manager to save costs. Depending on whether this strategy hurts overall senior tranche holders more than equity tranche holders, it also represents risk shifting.

3. **MANAGER CONSTRAINTS BY TYPE**

CLO managers are not completely free to pursue their own goals, but are subject to several constraints of various types. Such constraints have emerged as reactions by market participants to possible abuses. Such constraints can be categorized as structural and portfolio constraints; financial remuneration at the CLO level; and reputational concerns at CLO manager level.⁸

3.1. **STRUCTURAL AND PORTFOLIO CONSTRAINTS**

Structural and portfolio constraints come in a variety of forms, namely constraints on manager discretion, constraints on risk of the portfolio, and constraints on distribution of interest and principal proceeds (the "waterfall").

⁸ One could argue that the CDO manager's staff which manages a particular CLO may not necessarily follow the CDO manager's agenda and hence undertake actions which are not optimal and not profit maximizing for the manager. In such a case, financial remuneration and reputational concerns would not be effective in steering the staff of a manager in acting efficiently. It is assumed here that the incentives of CLO managers' staff are aligned with the objectives of the CLO manager as institution and that hence the financial constraints are effective. This seems to be a fairly realistic assumption. First, the staff of a CLO manager often receives bonuses linked to the overall performance of the CLO manager, and second, the reputation of a staff member managing a single CLO is 'personal', which means that an individual cares in the same way about reputation as the CLO manager as institution does.

3.1.1.CONSTRAINTS ON OVERALL DISCRETION

Table 1 provides information on the typical structure of CLOs that determine their overall degree of manager discretion. The benchmark which has emerged in the market are fully managed CLOs which allow the manager not only to trade credit improved and impaired loans, but also discretionary trading during the reinvestment period.

Table 1: Typical CLO characteristics

	Typical characteristics of European arbitrage cash flow CLOs
Management style	
Management level	Fully managed
Trading of credit impaired/improved loans	Yes
Discretionary trading	Yes
Annual trading bucket	20% of portfolio
Timeline	
Ramp up period	6 - 12 months
Non-call period	3 - 6 years
Reinvestment period	5 - 7 years
Legal maturity*	ca 15 years

*Source: S&P's presale reports of European CLOs. * Note that CLOs are usually called in soon after the end of the reinvestment period and rarely attain their legal maturity. See section 3.1. for a description of the terms.*

Overall, CLOs are vehicles which give considerable scope of discretion to managers. Broadly, two features distinguish them from static structures where the sole task of managers is to administer a predefined portfolio. First, the investors do not require the manager to have a full portfolio when they commit to funds but leave it up to him/her to fill the portfolio during the ramp-up period. Second, managers do not simply administer the portfolio but can actively trade loans to increase profits during the reinvestment period.

3.1.2. CONSTRAINTS ON PORTFOLIO QUALITY

Portfolio constraints limit the manager's ability to structure the portfolio in an adverse manner and are of two types: constraints on portfolio composition and constraints on overall portfolio risk. The former determine "buckets", or limits, for permissible asset types, while the latter define global limits on certain risk parameters of the portfolio. The main function of portfolio tests is to limit risk shifting of managers, but they work also as a "quality check" for managers' trading decisions and hence have also a dampening effect on managerial slack.

Constraints on portfolio composition

Bucket tests classify assets according to their risk profile and put limits on the inclusion of assets with certain risks in CLOs. Loans in general may be classified along several dimensions of risk. Most importantly, the risk profile of a loan depends on its level of subordination and the creditworthiness of the borrower.⁹

However, there are also contractual elements which affect a loan's risk. Examples are loans that lack certain covenants ("covenant-lite" loans), and which result in less scope for intervention by lenders once the borrower's performance begins to deteriorate, or payment-in-kind loans (PIKs), which enable

⁹ Other restrictions to limit concentration of risk include limits on exposure to single obligors, on industry concentration and on country concentration (although the later may vary and rating agencies might take into account specific strengths of CLO managers with respect to regions/countries).

the borrower to defer payments to the lender and to effectively prolong the lending arrangement. The bucket tests of CLOs usually capture a broad range of such risks.

Table 2 illustrates typical buckets relating to the subordination level of the loan.¹⁰ Senior loans rank highest in the level of subordination and are predominantly secured, e.g. they grant the lender access to the borrower's assets in case of non-payment. The bucket tests set a lower limit on the share of senior loans in the portfolio, since these are the least risky loans. Second lien loans rank behind senior loans and are usually secured as well. Mezzanine loans and high yield bonds rank third and fourth in the order of seniority, respectively, and are typically unsecured.¹¹ Because the recovery rate decreases in the level of subordination, these loans and bonds are riskier than senior loans.¹² For this reason, bucket tests set upper limits on the inclusion of second lien loans, mezzanine loans and high yield bonds in the CLO.

Table 2: Portfolio buckets (by subordination)

Bucket	Typical bucket size as% of portfolio
Senior (secured) loans	between min 75% - min 90%
Second lien	between max 10% - max 20%
Mezzanine	between max 10% - max 25%
High yield bonds	max 5%

Source: S&P's presale reports of European CLOs, own calculations

The specification of buckets is somewhat subject to change. Table 3 provides data on the appearance of certain buckets for riskier loans over time. The data show that CLOs have increasingly included buckets for second-lien loans and high-yield bonds, while the use of mezzanine buckets has also remained high.

Table 3: Evolution of portfolio buckets over time, European CLOs

Data	2004	2005	2006	2007
Second lien bucket (% of CLOs with bucket)	6	19	48	63
Mezzanine bucket (% of CLOs with bucket)	94	81	79	92
High yield bond bucket (% of CLOs with bucket)	29	52	48	71

Source: S&P's presale reports of European CLOs, own calculations.

Interpretation of these data is, however, not completely straightforward. To conclude that the scope for risk taking has increased since CLO managers have been given more discretion to choose from risky loan types would be premature, since CLO managers must still invest primarily in senior secured loans.¹³ There remain some doubts on the effectiveness of bucket tests for two reasons.

First, the proliferation of second-lien and high-yield bond buckets suggests that the bucket specifications may have responded to the evolution of loan markets and the emergence of certain loan types. Second-lien loans became very popular in the LBO boom, as they offered borrowers a cheaper

¹⁰ Other bucket tests include synthetic securities, structured finance securities, participations, fixed-rate securities, securities paying less frequently than annually.

¹¹ There is no single definition of second lien and mezzanine loans and the terms differ in the US and Europe. In Europe, second lien loans are usually secured, while mezzanine is unsecured debt (Fitch, 2006).

¹² There is little reliable information on "true" recovery rates of European leveraged loans due to differences across jurisdictions within Europe and individual loan characteristics. Rating agencies assign similar recovery rates to second lien and mezzanine loans despite on the different level of subordination. High yield bonds exhibit the lowest recovery rate due to their lowest subordination.

¹³ The average share of senior secured loans in CLO portfolios has remained stable at around 83% over the last few years.

means of finance than senior secured loans, and they were attractive for lenders because they were supposedly less risky than mezzanine loans. Hence, the increase in the use of second-lien buckets might simply reflect the availability of these loans in the market. There is also evidence that CLO managers were increasingly seeking to include high-yield bonds buckets in CLOs, as they were having difficulty in sourcing enough leveraged loans to ramp up an entire portfolio. Again, this points to a potentially market driven specification of buckets. These developments suggest that bucket tests may not be limiting the portfolio risk of CLOs; rather, they may be reflecting the emergence of riskier asset types in the market. For example, there is evidence that the aggressive and "loan-heavy" structure of private equity deals has likely shifted up the risk profile of subordinated loans, including second-lien loans, with negative consequences for the recovery rate and default probabilities of the loans. Hence, it is conceivable that the proliferation of second-lien buckets has actually provided greater leeway for managers to source risky loans.

Second, bucket may not capture all types of relevant risk. For example, there are no buckets for covenant-lite loans, since these loans qualify as senior secured loans. However, the lack of covenants reduces the scope for lender intervention, which is reflected by the rating agencies' practice of applying a haircut on the recovery rate of cov-lite loans of 10% (See e.g. Fitch, 2007e). There are two concerns with cov-lite loans. The first is about transparency: A portfolio consisting of 100% cov-lite (senior secured) loans may seem less risky than a portfolio with 80% senior secured loans and 20% mezzanine or second lien loans, but actually may entail a higher risk (or lower overall recovery rate).¹⁴ The second concern is related to the reliability of estimates of recovery rates. There is evidence that market participants have overestimated the recovery rates of cov-lite loans and are now revising them (see, for instance, Fitch, 2008b). Hence, a drawback of current bucket tests might be a missing bucket for cov-lite loans.

Overall, there remain thus some doubts whether the buckets tests do effectively limit risk taking or at least do flag all risky positions.

Constraints on overall portfolio risk

The constraints on overall portfolio risk are likely the most important constraints on managers. **Table 4** highlights the tests that aim at limiting the risk of the portfolio.

Coverage tests play a fundamental role in the tranching of the securities issued by the CLO, as these tests govern the size of the "cushion" for senior tranche holders' claims. The coverage tests are individually tailored to each CLO to take into account that CLO's portfolio characteristics. Over-collateralisation (O/C) tests define a lower threshold for the ratio of par value of total assets to the value of the senior tranche and thereby ensure that a portion of the portfolio can default without putting the senior tranche at risk. Interest coverage (I/C) tests require the portfolio to generate a sufficient level of interest payments to guarantee that the interest payments to senior tranche holders are protected. When coverage tests fail, the CLO manager must start redeem the (senior) tranches until the coverage of (senior) tranches reaches the predefined limit (see section 3.1.3 below for the mechanics of tranche redemption).

¹⁴ To see this, consider a simple numerical example where the recovery rates are as follows: (full covenant) senior secured 50%, cov-lite 40%, mezzanine 20%. A portfolio with 100% cov-lite loans has a recovery rate of 40%, while a portfolio of 80% full covenant senior secured loans and 20% mezzanine loans has an average recovery rate of 44% (assuming in both cases that 100% of the portfolio defaults).

Table 4: Overall portfolio tests

Portfolio test	Comment
Coverage test	
Par coverage ratio	Over-collateralization test (O/C tests)
Interest coverage ratio	Interest coverage test (I/C tests)
Collateral quality tests	
Maximum weighted average maturity (WAM)	Limit on average maturity of portfolio to avoid forced sale of assets when liabilities mature
Minimum weighted average spread (WAS)	Ensures payment of interest rates and sufficient cash flows
Minimum weighted average recovery rate	Requirement to maintain a minimum average recovery rate
Minimum weighted-average rating (WAR)	Indicator of the average credit risk of a portfolio
Portfolio evaluation	
Quantitative portfolio analysis	Estimates credit risk of portfolio, allows for the rating of tranches. Inputs are usually default rates and recovery rates of assets and their correlation. Other portfolio tests are derived from this data. For the ratings of tranches, Moody's calculates the expected loss of a tranche (considering both probability and severity of default), while S&P and Fitch use "probability of a first dollar loss" (considering only probability of default).

Source: S&P (2002a)

The collateral quality tests provide thresholds on certain key measures of credit risk, including average asset maturity, spread, and rating. Finally, in order to calculate the precise risk profile of a portfolio and to justify the rating (and to calculate the coverage tests), rating agencies use methods of portfolio default analysis. If one of the overall portfolio tests fails, the CLO manager is restricted to reinvestments in assets that improve the test. For meeting the tests, a CLO manager may also "trade" between the tests according to a matrix. For example, he may trade assets that reduce the average spread but increase the average recovery rate of the portfolio.

It should be noted that the effectiveness of such portfolio tests depends crucially on the reliability of estimates of the underlying risks. Rating agencies may not always be able to estimate the true risk of certain loans, which may give managers scope to increase portfolio risk if they believe that the agencies have underestimated the true risk. In particular, concerns have arisen with respect to the recovery rates of loans of different levels of subordination.

3.1.3.CONSTRAINTS IMPOSED BY THE WATERFALL

The "waterfall" is an important structural provision to ensure that the senior tranche investors' claims enjoy priority over equity tranche holders' claims. Thus, the waterfall aims at reducing the scope for risk shifting. A waterfall usually follows several principles in order to ensure the desired ordering of claims.

A first set of principles centres on the separate treatment of interest and principal proceeds. Interest proceeds represent interim profits and are usually paid out regularly, which means that they cannot be used to reduce principal risk. Therefore, CLOs have actually two waterfalls - one for interest proceeds and one for principal proceeds - where interest proceeds are only distributed when the principal is sufficiently protected. This necessitates also the clear separation of interest and principal proceeds. A manager may be tempted to mask principal proceeds as interest proceeds and distribute them to the senior and equity tranche investors. This could be done by purchasing loans below par and redistributing the difference between par and the loan price as interest proceeds (see section 2.1). Hence, the CLO documentation specifies that unused proceeds should not be paid out but used to purchase additional collateral to increase the over-collateralisation of the tranches. The rating

agencies impose such guidelines to clearly distinguish between interest and principal proceeds and to prevent harm to senior tranche holders through purchase of weaker loans.¹⁵

A second set of principles governs the pay down mode of the tranches. With respect to principal payments, the pay-down method can be either sequential or pro-rata (or may combine both sequential and pro-rata elements). The sequential method stipulates that proceeds are paid down first to the most senior tranche holders (effective over-collateralisation increases) while the pro-rata method stipulates the simultaneous pay down of the senior and equity tranche (effective over-collateralisation remains constant). Table 5 presents a numerical example which highlights the differences of the pay-down methods.

Table 5: Comparison of pay down methods assuming a 10€ asset sale

	Original portfolio	Sequential pay down	Pro-rata pay down
Assets	100€	90€	90€
Senior tranche	80€	70€	72€
Equity tranche	20€	20€	18€
Overcollateralization	125% (100/80)	129% (90/70)	125% (90/72)

The overcollateralization ratio also determines the default rate that a portfolio can sustain without harming the senior tranches. In this example, the sustainable default rate (given by the ratio of equity tranche to total assets) is 20% for the original portfolio and in the pro-rata pay down scenario and 22.2% in the sequential pay-down scenario.

The tranches are paid down either at the discretion of the manager (or equity tranche holders) to lock in profits at a given date (after the end of the reinvestment period) or when covenant tests are breached. In the former case, the value of the portfolio will be sufficiently high to satisfy the claims of the investors and hence the choice of the pay down method is of minor importance (unless there are unexpected negative events during the period in which the tranches are redeemed). In the case of breached covenants, the situation is different. A breach of covenant tests means that the claims of the senior tranche investors are at risk. In this case, the pay down method matters, as only the sequential pay down method will be effective in remedying the violation of the covenants and bringing the risk to senior tranche holders back to the permitted limit. For this reason, rating agencies require all European CLOs to use the sequential pay down method when covenants have been breached.

3.2. FINANCIAL REMUNERATION AT THE CLO LEVEL

The remuneration scheme determines the fees which the managers receive for running a CLO. In addition, the managers may have "skin in the game" by retaining a portion of the equity tranche.

3.2.1.CONSTRAINTS IMPOSED BY THE REMUNERATION SCHEME

The remuneration scheme determines the financial incentives for a CLO manager and therefore potentially has a strong bearing on managerial slack and risk shifting incentives. In order to limit managerial slack, a remuneration scheme must be performance sensitive - that is, it must reward the manager sufficiently for efforts to increase return to the investors. Risk shifting incentives depend on the degree to which the manager's incentives are aligned with those of equity tranche holders.

¹⁵ For instance, S&P requires the difference between par and purchase price of a loan not to be distributed but "trapped" in the portfolio to increase over-collateralisation (S&P, 2002a). Then, the incentives to buy discounted loans and loans at par are roughly equal.

The typical European CLO stipulates management fees, which are embedded in the interest proceeds waterfall and paid out periodically, and an incentive fee which is paid out when the CLO matures or is called. The management fees are embedded in the interest proceeds waterfall and consist of a senior and a subordinated fee component. The senior management fee ranks senior to interest payments on senior tranches and varies between 10-20 bps of total par amount per year. This fee component resembles thus an annual management fee that depends only on the collateral size but not on performance. The subordinated management fee equals 40-50 bps of total par amount per year. It ranks below senior tranche payments but above equity tranche payments and is therefore linked to the performance of the senior tranche. The incentive fee is paid out at maturity (or when the CLO is called) when the return to equity tranche holders exceeds a certain threshold of usually 12% internal rate of return (IRR). The size of the incentive fee is typically 20% of returns to equity tranche holders above the threshold.¹⁶ This fee is obviously linked to the performance of the equity tranche. Table 6 provides an illustrative calculation of manager remuneration, using a typical compensation scheme seen in most CLOs.¹⁷

Table 6: Example calculation of CLO management fees

	Fee size	Fee p.a. (m€)	Fee over lifetime (m€)		
			12% IRR	18% IRR	24% IRR
Senior management fee	15bps of 500 m€	0.75	4.5	4.5	4.5
Subordinated management fee	45bps of 500 m€	2.25	13.5	13.5	13.5
Incentive fee	20% of IRR > 12%		0	7.3	16.6
Total fee			18	25.3	34.6
Increase in total fee				41%	92%

Note: Assumed size of portfolio 500 m€, a 450 m€ senior tranche and a 50 m€ equity tranche outstanding; six-year lifetime (it is assumed also that all tranches are redeemed instantaneously after the sixth year). The internal rate of return (IRR) denotes the annual rate of return of the portfolio.

The performance-sensitive components (subordinated management fee and incentive fee) represent the largest part of the total fee. The incentive fee can make up a significant share of the total. It is worth noting that the CLO manager can also earn substantially higher fees when he/she achieves a return above the 12% internal rate of return (IRR) hurdle. In the example above, the manager earns incentive fees of 7.3 (16.6) million euro if he achieves 18% (24%) IRR. This represents a 41% (92%) increase in total fees compared to the benchmark of 12% IRR.

The high proportion of performance-based components (subordinated and incentive fees) should provide sufficient incentives to the managers to exert effort to maintain the quality of the portfolio, unless bad portfolio quality can go undetected for several years during which the manager receives the subordinated management fee. CLO managers are rewarded for increasing returns to equity tranche holders, but the subordinated management fee remains the largest fee component unless the CLO delivers very high returns, in which case the incentive fee can become the largest component (24% in this example). It can thus be said that the remuneration scheme generally provides balanced

¹⁶ Note that in some cases, the incentive fee is paid out at each payment date (as % of total portfolio -usually 10 bps) after distribution of proceeds to investors.

¹⁷ In a recent study, S&P analysed the performance of fifty-three CLOs that were originated between 1999 and 2004 and have been called in (S&P, 2008). The internal rates of return across the whole sample had a mean of 15% and ranged from -30.4% to 40.1%. However, the IRR range was only 5.51% to 35% for CLOs originated between 2000 and 2004).

incentives to the managers. In other words, it reduces managerial slack but at the same time does not appear to provide "excessive" incentives to shift risk.

3.2.2.RETENTION OF THE EQUITY TRANCHE

A potentially powerful way of aligning the incentive of the CLO managers with (equity tranche) investors is to require the manager to have "skin in the game", that is to hold (a portion of) the equity tranche. However, it is subject to debate in the CLO manager market whether retention of a portion of the equity tranche should be a requirement or left to the managers' discretion. Standard market practice does not require CLO managers to hold a stake in the equity tranche. S&P, for instance, argues that the (partial) ownership of equity tranches is only one of the incentive-aligning mechanisms besides the remuneration scheme and reputation (see the following section for a discussion of reputational constraints) and does advocate a general requirement (S&P, 2002c).

Interestingly, CLO managers often retain a portion of the equity tranche (for some or all of their CLOs), which is documented in the CLO prospectuses as buy/hold requirement. This section uses information from the CLO prospectuses to assess the determinants of requirements to buy and hold a portion of the equity tranches. Table 7 provides an overview of the distribution of buy- and hold- requirements in a sample of 169 European CLOs. Only 20% of CLOs have no requirements, while 80% of the CLOs require the manager to buy a certain portion of the equity tranche at the closing date of the CLO. These CLOs, in turn, differ in their requirement to hold the equity tranche. Some managers may sell their portion at any time after the closure date (ca 38% of all CLOs), while others require the manager to hold a certain portion of the equity tranche (possibly a lower amount than purchased at closure date) until the CLO is called in (ca 42% of all CLOs).

Table 7: Buy-and-hold requirements, all CLOs

	Freq.	Percent
No requirements	35	20.71
Buy-but-not-hold	64	37.87
Buy-and-hold	70	41.42
Total	169	100.00

There is also considerable difference with respect to the amount that the managers must buy and eventually hold. Table 8 gives an overview on the size of equity tranche purchase and holding requirements. The data shows that there is a considerable variation in the size of the equity tranche holding, also in terms of share of total portfolio. Note that CLO managers often do not need to hold the entire portion they had to buy. Hence, holding requirements tend to be lower.

Table 8: Size of buy and size of holding stake, all CLOs

	Mean	Percentiles					min	max
		10%	25%	50%	75%	90%		
Buy requirement (m€)	11.05	2	4	7	11	25	1	139
Buy requirement (% of equity tranche)	22.7	5.6	9.5	16.2	25.7	49.1	2	100
Hold requirement (m€)	7.22	2	4	6	9	14	1	28
Hold requirement (% of equity tranche)	16.6	9.1	15.4	23.5	25.7	9.1	2	62.9

Note: buy requirements sample of all CLOs with either buy and hold or buy-but not hold requirement.

What determines whether CLO manager buy and eventually hold a portion of the equity tranche or not? Since buying/holding part of the equity tranche is a device to align incentives, one would expect that the requirement to hold or buy depends on the variables that are related to the agency problem

involving CLO managers. In the following, a set of variables related to one of the several dimensions that matter for agency problems is used to estimate buy-and-hold requirements:

- **Variables reflecting the size and riskiness of a CLO.** "Size of CLO" denotes the size of the total asset pool purchased by the CLO, "Size of equity tranche" denotes the size of the equity tranche and may serve as a rough proxy for the riskiness of a CLO (everything else being equal, a larger equity tranche might indicate that the portfolio is more risky and enhance cushion for senior tranche holders must be larger). "CLO leverage" is equal to the ratio ("Size of CLO"/"Size of equity tranche") and a proxy for the riskiness of a CLO structure.¹⁸ The higher the "leverage", the smaller the equity tranche and hence the less risky the portfolio tends to be.
- **Variables reflecting reputation/experience of manager.** "Inexperienced manager" is a dummy variable that equals 1 when the CLO manager has less than 18 months of market experience (measured as time passed after closing date of the manager's first CLO) at the closure date of a given and when the manager was not active in the US before. "New US manager new in Europe" is a dummy variable that equals 1 when a manager had previous experience in the US but less than 18 month of market experience in Europe.
- **Variable reflecting time trend and competitive effects.** "Date of CLO closure" is a time trend variable that measures linearly the passage of time. This variable captures market trend and competitive effects that have potentially an effect on requirement to buy and hold.

In the following some regressions are presented that focus on the on the requirement to buy and hold in a qualitative fashion (yes/no), neglecting the amount of purchase/holding. There are three possible outcomes with respect to the requirement to buy and hold: No requirement at all, required to-buy-but-not-hold, required to buy and to hold. At the outset, it is not clear whether the requirement to buy or the requirement hold has a stronger effect on incentives and hence a distinction between buying or not or holding or not may be more required. In the following estimation, different specifications are used (see Table 9) which allow for comparisons of the buying requirement and holding requirement.

Table 9: Buy and hold requirements and estimation specifications

CLO prospectus	Binomial logit(1)	Binomial logit(2)	Multinomial logit
No requirement	0	0	0
Requirement to buy, no requirement to hold	1	0	1
Requirement to buy and requirement to hold (possibly less than amount bought)	1	1	2

¹⁸ See Morgan Stanley (2006), Chapter 1.

Table 10: Estimation of buy/hold requirements

	Dependent variable (base outcome is no requirement)			
	Requirement to buy (1) Binomial logit	Requirement to hold (1) Binomial logit	(1) Req to buy but not to hold Multinomial logit	(2) Req. to buy and to hold Multinomial logit
Date of CLO closure	-0.002 (2.64)**	-0.002 (4.03)**	-0.001 (1.43)	-0.002 (3.58)**
Size of CLO	0.009 (3.10)**	0.002 (0.99)	0.008 (2.97)**	0.008 (2.86)**
CLO leverage	-0.205 (1.66)	0.131 (1.31)	-0.3 (2.18)*	-0.093 (0.67)
Inexperienced manager	1.15 (1.98)*	0.681 (1.72)	0.925 (1.48)	1.391 (2.23)*
US manager new in Europe	-1.002 (1.97)*	-2.008 (2.91)**	-0.485 (0.91)	-2.303 (2.97)**
Constant	25.877 (2.71)**	24.239 (3.84)**	15.149 (1.48)	36.677 (3.53)**
Observations	165	165	165	
Classification accuracy	82%	70%	57%	

Note: Absolute value of z statistics in parentheses, * significant at 5%; ** significant at 1%.

Table 10 depict the estimation results. The results can be interpreted as follows.

- **Model choice - importance of buy versus importance of holding requirement.** Overall, it seems that the first binomial logit specification which distinguishes along the buying criteria but not the holding criteria delivers the best results, as indicated by the classification accuracy.
- **Presence of a market trend/ relevance of competitive effects.** The coefficient of "Date of CLO closure" is negative and significant: Managers tend thus to buy/hold less often over time a portion of the equity tranche. This may point to a loosening of standards in the market, and might be associated with the enormous growth in the last years and massive entry of new managers (See section 4.3 for a description of the CLO market structure).
- **Manager experience matters.** Inexperienced European managers tend to be required more often to buy/hold a portion of the equity tranche (significance at 5% level depends on specifications). This would confirm the view that the managers' reputation/experience matters for CLO performance. The role of US managers new in Europe is different. On the one hand, they have experience from running CLOs of US leveraged loans, but they are new to the European market. The estimations show that they are less frequently required to buy/hold a portion of the equity tranche.
- **Portfolio size/risk characteristics.** The effect of the size of the CLO on buy/holding appears to be positive in the first estimation. With respect to riskiness of the CLO as proxied by the CLO, it seems that low risk CLOs (as measured by a higher CLO leverage) tend to have less frequent buying requirements.

In sum, the analysis suggests that the retention of a portion of the equity tranche still plays a role in CLO management and appears to be related to factors that matter also for the agency problem in CLO management.

3.3. CONSTRAINTS IMPOSED BY REPUTATIONAL CONCERNS

Concerns about reputation may also serve as a powerful incentive device for managers to act in the best interest of investors. Reputation matters for players who act repeatedly in the market and who are concerned about their standing with the parties they are dealing with. Assuming that managers must establish a good reputation with senior tranche and equity tranche investors, reputational constraints may be effective with respect to both risk shifting and managerial slack.

Reputation can be seen as a form of intangible capital that is costly to accumulate. Newcomers with the intent to stay in the market for a long time have an incentive to invest in reputational capital to facilitate business in the future, while established players with reputational capital have incentives to act prudently so that the reputational capital does not depreciate. It is therefore interesting to analyse the structure of the CLO manager market and to attempt to assess whether reputational concerns matter.

Table 11 and Figure 1 provide information on the structure of the CLO market. The market data show that the boom of leveraged loan and CLO issuance, which lasted until summer 2007, has led to a heterogeneous CLO manager market. Although most of the CLO managers have a long track record and many CLOs under management, there are also a number of smaller and younger players with only one or two CLOs under management and little market experience.¹⁹ The former have managed to establish a certain level of reputational capital, while the latter still need to do so. Generally,

¹⁹ It is conceivable that the market newcomers had relevant experience through recruitment of experienced staff. However, the evidence points to the fact that the staff of many of the newcomer CLO managers (such as the US managers) had very little experience in the European leveraged loan market.

reputational concerns matter since the market is not a one-shot market but managers are usually acting repeatedly. As the issuance of new CLOs has slowed dramatically since the summer of 2007, the market structure is likely to remain stable for some time, until the active CLOs are called in.

The importance of the manager and reputational concerns is also documented by the fact that rating agencies monitor and rate managers. In the rating process, rating agencies place a high importance on manager's performance record. Fitch, for instance, has seven criteria to rate a manager of which past CDO performance is among the most important (25% weight). When assessing CDO performance, Fitch checks the whether coverage tests are in compliance; whether there has been a down grade of tranches, return to equity tranche holders; the development of the par amount of a portfolio among others. Thus, manager ratings reflect CDO performance with respect to all tranche holders.²⁰

Overall, it seems that reputational concerns play a large role in the CLO manager market. Such concerns should be effective in disciplining managers to serve senior and equity tranche investors.²¹ However, two main concerns relate to the effectiveness of reputational concerns in the period preceding the events of the summer of 2007.

First, the overall effect of reputational concerns may have been limited, due to the favourable market conditions prior to the summer of 2007. This applies to all CLO managers, as even the most experienced had not faced very tough market conditions. The benign conditions were not suited to fully revealing the differences between CLO managers, and investors may have had problems attributing a high return to the performance of the manager or simply to the favourable market. In fact, managers' concern about reputation and investors' difficulties in recognising manager quality could have generated incentives for managers to engage in risky and inefficient strategies to produce good performance.²² In a related manner, reputational concerns may also not have been effective with respect to capabilities that have not yet been fully tested. Specifically, CLO managers may have had incentives to save on workout capabilities, betting on continued benign market conditions. There is indeed evidence that CLO managers differ with respect to their willingness and capacity to conduct workouts.²³

Second, younger managers in particular may have had incentives to take excessive risk. The reason is that they may have sought to realise high returns in order to quickly to establish a favourable reputation with investors and to be able to set up additional CLOs. The performance of a new manager with respect to equity tranche holders quickly becomes visible as projected or realised interim returns; however, the performance with respect to senior tranche holders is less visible, as it only represents a binary signal (whether or not there was a breach of a test) and will likely only be fully revealed in adverse market conditions. This asymmetry may have provided incentives to new managers to "gamble" and take excessive risk. Typically, a European CLO manager must manage at least two or three CLOs to economize on the fixed costs of running the platform and to become

²⁰ According to market participants, rating agencies also apply slightly more stringent portfolio quality tests to new CLO managers. The fact that investors asked a premium on the debt pricing for first time managers is also evidence of importance of manager experience and reputation.

²¹ S&P says also that the identity of the manager is the primary reason for investors whether to invest or not in a CLO (S&P, 2002b).

²² See Rajan (1994) for a model where reputational concerns lead banks to pursue inefficient credit policies.

²³ One could argue that CLO managers could invest in workout capabilities by hiring adequate staff when necessary. However, the hiring of staff is time-consuming and costly. It is therefore questionable whether a CLO manager could react in time to a crisis or deteriorating environment.

profitable, which provides a rationale for managers to quickly return to the market for a new CLO issuance.²⁴

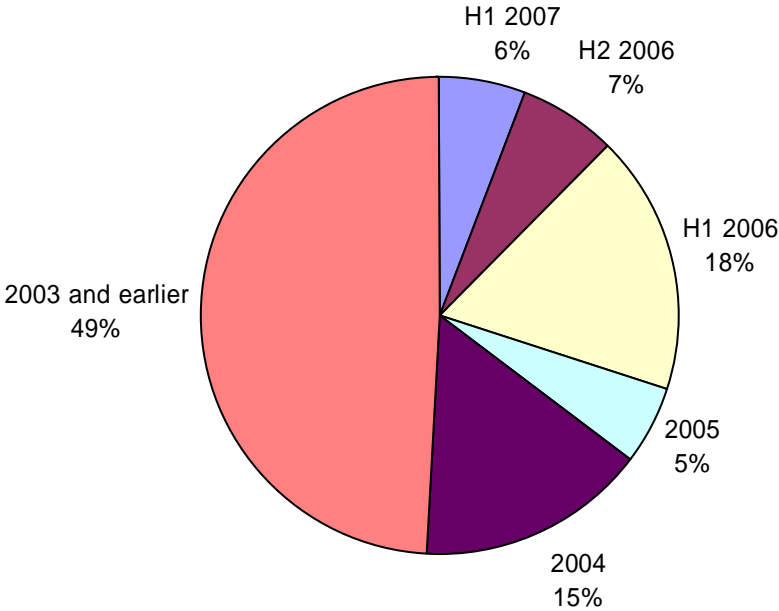
Table 11: Ranking of active European managers at end of H1 2007 (by AUM)

#	Manager	# CLOs	AUM (m €)	Market entry (qq-yy)	#	Manager	# CLOs	AUM (m €)	Market entry (qq-yy)
1	Alcentra	13	6265	IV-00	29	Henderson Global Investors	3	875	IV-03
2	Harbourmaster	8	5358	IV-04	30	Eaton Vance Management	2	871	II-06
3	Babson Capital Europe	8	4575	II-01	31	CQS	2	803	II-06
4	Mizuho	5	2990	II-04	32	NAC Management	2	800	II-06
5	Carlyle ELF	6	2869	II-05	33	BNP Paribas	3	779	III-03
6	Avoca	6	2811	IV-03	34	Natexis Banques Populaires	2	600	III-04
7	Intermediate Capital Managers	6	2534	III-02	35	Rabobank	2	552	II-05
8	Highland	4	2193	III-01	36	LightPoint Capital Management	2	532	III-06
9	PIMCO	4	1987	II-02	37	Caja Madrid	1	500	II-07
10	RMF Investment Management	5	1928	IV-02	38	Sankaty Advisors	1*	491	III-06
11	Prudential M&G	5	1741	I-03	39	CVC Cordatus Group	1	440	I-07
12	CSFB	4	1726	III-04	40	Egret Capital	1	410	IV-06
13	AXA Investment Managers	4	1545	III-00	41	Penta Management	1	405	II-07
14	Blackstone Debt Advisors	3	1524	I-06	42	ACA Capital Management	1	400	II-07
15	GSC Partners	4	1518	III-03	43	Bank of Ireland	1	400	IV-03
16	Halcyon	3	1385	II-06	44	GoldenTree	1*	395	III-06
17	Pramerica IM	3	1289	I-06	45	Deutsche Asset Management	1*	387	IV-06
18	AIB Capital Markets	3	1221	I-02	46	AIG-Mezzvest Investments	1	383	II-03
19	IKB	3	1197	I-06	47	AIG Global Investment	1*	375	III-06
20	Elgin Capital	3	1168	II-06	48	Aladdin Capital Management	1*	362	II-07
21	Investec Bank	3	1148	II-06	49	Ares Management	1*	356	II-07
22	Royal Bank of Scotland	3	1143	IV-01	50	Morgan Stanley IM	1*	350	I-07
23	NIBC Bank	3	1100	II-03	51	KBC	1	341	IV-06
24	Cheyne Capital Management	1	990	I-06	52	Cairn Financial Products	1	341	IV-06
25	Indicus IM	2	936	I-07	53	Calyon	1*	330	IV-06
26	Alpstar Management	2	923	II-06	54	Resource Europe Management	1*	300	II-07
27	Invesco	3	917	II-02	55	WestLB	1	300	III-05
28	Oak Hill Advisors	2	896	III-06					

Source: S&P's Quarterly Reviews of European CDOs of Leveraged Loans, own calculations. *US CLO manager with a single European CLO. # CLOs denotes active CLOs of a manager at the end of H1 2007 as listed in S&P's European CDOs Of Leveraged Loans Q2 2007 Review. AUM (assets under management) is the sum of issued tranches of active CLOs under management.

²⁴ See the comment of a Fitch analyst on the CLO managers' critical mass Dow Jones Financial News, "Financial News profiles influential CDO managers", 30 May 2008 (available at www.efinancialnews.com/usedition/index/content/2350773575).

Figure 1: Market share of CLO managers by their time of market entry



Market share as % of total assets under management (AUM) at end of H1 2007. Source: S&P's Quarterly Reviews of European CDOs of Leveraged Loans, own calculations

4. DISCUSSION OF EFFECT OF CONSTRAINTS ON RELEVANT DIMENSIONS

How do these constraints affect the CLO managers' discretion in the aforementioned dimensions?

4.1. CONSTRAINTS ON LOAN SOURCING AND TRADING

4.1.1. THE RAMP-UP STRUCTURE

CLO managers are given a relatively large discretion how to structure the ramp-up period of each CLO. Usually, managers are granted between 6 and 12 months ramp-up time during which they can fill up the portfolio. At the closure date (begin of ramp-up period), a portfolio is usually only 40%-70% filled. During the ramp-up period, there are usually no tests in place which could allow investors to intervene should the manager fail to build up a proper portfolio. However, the manager must seek rating confirmation once the ramp-up period is over and the portfolio is filled, i.e. when the CLO becomes effective. At this date, the portfolio must comply with the portfolio composition/quality tests. If the portfolio does not, the manager must pay down sequentially the tranches to restore overcollateralization. There exist also measures which give investors the possibility to intervene before the effective date such as stipulating a phased ramp-up period. If a CLO has a phased ramp-up period, its portfolio must comply with certain portfolio tests already during the ramp-up period at different stages. However, European CLOs have seldom such restrictions.

While a long ramp-up period has advantages such as giving access to a larger number of issues and enabling the manager to weather short term supply interruptions, it also bears the risk that underperforming managers are not put under pressure early on. Anecdotal evidence suggests that managers with good sourcing skills can fill their portfolio relatively quickly: Alcentra, for instance, filled the portfolio of its CLOs on average 4.4 within months, while the allowed average ramp-up period was 8.4 (Fitch, 2007c); and Mizuho ramped-up the Harvest I and Harvest II CLOs in 6 and 7 months, given a covenanted level of 12 months (Fitch, 2007d). It can be argued that the long ramp-up periods of around 9-12 months give much leeway to managers and do not exert sufficient pressure on managers to prove they are able to source good loans in a timely manner. Even though these managers pass

the portfolio tests at the effective date, the negative carry puts a strain on the portfolio and aggravates scope for conflicts in the ensuing reinvestment period.

4.1.2.SOURCING AND TRADING OF UN-IMPAIRED LOANS

At first sight, the nature and the number of the different constraints suggest that managers are effectively disciplined in building and maintaining a high quality portfolio. The remuneration scheme and reputational concerns should be fairly effective in incentivizing managers to serve investors and the portfolio constraints should broadly ensure a prudent portfolio composition.

However, some uncertainties remain on the effectiveness of the constraints on the portfolio quality and composition. Ultimately, most portfolio quality test and the overcollateralization tests depend on assumptions on the default probability, default correlation and recovery rate of the loans in the portfolio. Hence, it is of great importance that these assumptions are 'correct' and reflect the true risk of the portfolio. Any underestimation of the true risk gives managers the scope to fill the portfolio with low quality or too risky loans. An indication that the portfolio tests do not always keep track with market developments is Fitch's current effort to modify rating methodology and, among other measures, to adjust assumed recovery rates and default rates (Fitch, 2008a and Fitch, 2008b). Recent developments, such as the abolishment of covenants and the high leverage employed in private equity deals have required an update of traditional estimates.

Furthermore, the large difference of realized equity tranche returns across CLO managers point to the fact that the 'manager matters' and that the portfolio tests leave some scope for managers to pursue different strategies.²⁵

It is also conceivable that the portfolio tests allow managers to choose a certain risk-reward profile at the outset. This is evidenced by the fact that the targeted weighted average rating (WAR) of a CLO portfolio as defined in the documentation differs. While most CLO portfolios target a WAR of B+, some portfolios are slightly riskier (WAR of B) and others less riskier (WAR of BB-). Riskier portfolios might be structured in favour of equity tranche holders and less risky portfolios in favour of senior tranche holders. Note that also the structure of the riskier portfolio must warrant a high rating of senior tranches. This implies that those low risk portfolios are not pushed to the limit and that managers have some leeway in choosing a different risk/reward profile. This raises the question whether the portfolio tests are tight enough to only allow only modest risk taking or whether the gap is too high.

4.1.3.CONSTRAINTS ON TREATMENT OF IMPAIRED LOANS

Basically, CLO managers have two options when a loan is impaired: They can either sell the loan in the secondary market or they can keep the loan in their portfolio and go through a work-out themselves. CLO managers must solve the trade-off between holding an impaired loan (at assumed recovery rate) in the portfolio (with the chance that the borrower can reinstate payments), or selling it, realizing thereby losses on the par amount but reducing the credit risk of the portfolio (The usual portfolio tests apply). Note, however, that the choice between selling or going through a work-out implies that the CLO manager has work-out skills in the first place. Thus, a further question related to the treatment of impaired loans is then whether CLO manager invest sufficiently in work-out capabilities.

CLO manager enjoy leeway in their treatment of impaired loans, as there are no restrictions in place. CLO managers are neither required to sell off any impaired loans, nor are they obliged to go always through a work-out. There are also no provisions that require CLO managers to have work-out capabilities. In the absence of explicit rules, reputational concerns may ensure that CLO managers

²⁵ See S&P (2008) for an analysis of equity returns of US CLOs.

make the right decisions, though. In order to maintain a good track record and their rating, CLO managers might try their best to do the right investment or trading decisions.

However, there is reason to believe that reputational concerns are not effective with respect to the decision to invest in work-out capabilities. In the last years, market conditions have been benign and default rates low. In such an environment, both CLO managers with/without dedicated work-out skills had the opportunity to achieve high returns. Although rating agencies have assessed also the workout experience and capabilities of managers, it is not clear whether this has been sufficiently appreciated as sign of manager quality by investors and market participants.

It is therefore instructive to analyze CLO managers in this respect.²⁶ Table 12 below presents some evidence on the heterogeneity of CLO managers with respect to their work-out strategies. Most of the managers are in principle capable of going through a work-out since they have a dedicated work-out specialist, but nonetheless seem to prefer selling an impaired loan early in the secondary market. Two managers (Avoca, Investec Bank) do not have a dedicated workout specialist and claim to adhere to a strict sell strategy (Note that Avoca is of considerable size and ranked 6th in the European CLO market). There is only one manager (Harbourmaster) which is committed to a proactive role in managing impaired loans and which regards the ability to go through work-outs as competitive advantage. Harbourmaster has also demonstrated the willingness and ability to lead workout negotiations (Fitch, 2007a).

Table 12: Manager profiles with respect to work-out capabilities

Manager	AUM (m€)	Dedicated Workout specialist (#)	Overall strategy (impaired loans)
Alcentra	6,265	Yes (1)	Sell/workout if necessary
Avoca	2,811	No	Sell
Axa Investment Managers	1,545	Yes (11)*	Sell/workout if necessary
Babson Capital Europe	4,575	n.a.	Sell/workout if necessary
Golden Tree Asset management	395	n.a.	Sell
Harbourmaster	5,358	Yes (>3)	Proactive workout
Intermediate Capital Managers	2,534	n.a.	Sell/workout if necessary
Investec Bank	1,148	No	Sell
Mizuho	2,990	Yes (1)	Sell/workout if necessary
Prudential M&G	1,741	Yes (1)	Sell/workout if necessary

*Source: S&P's Manager Focus, Fitch Manager Profiles and Manager Reports. *across whole Axa Investment managers group.*

There are substantial differences between CLO managers with respect to work-out strategies. While a substantial share of managers seem to have invested prudently in work-out capabilities, some managers have saved on such investment, relying on continued low default rates and/or a liquid secondary market.²⁷

²⁶ Here, ability to go through a work-out is measured in terms of dedicated work-out specialists. Another measure is the work-out experience of the staff and the size of staff. The latter is important with respect to work-outs, as (impaired) loan screening and -analysis is time consuming. A tightly staffed manager might hence have insufficient capacities in a downturn. However, it is difficult to assess whether the staffing decision of a manager is motivated by work-out considerations, or whether it reflects the general approach to selecting loans. Evidence of a dedicated work-out specialist is more informative about the strategy of a CLO manager.

²⁷ Note that the sample included mostly large managers, and that the smallest managers in the sample (Golden Tree Asset Management and Investec Bank) are pursuing sell strategies. Hence, one may ask whether most of the small newcomers among the CLO managers do not have the capabilities to go through work-outs. Bearing in mind that work-out capabilities represent fixed costs, small manager benefit more on saving on this costs than large managers.

While these differences have not crystallized in the recent years characterized by low defaults, they likely become apparent when the credit cycle turns down. Managers that adhere to a strict sell strategy are likely to under-perform when secondary market liquidity dries up, but what is even more important is that they may also further aggravate the situation in a dislocated secondary market. When default rates are high, work-out capacities are scarce, and a massive sell-off of loans by those managers will further deprive prices in the market.

5. CONCLUSION

The aim of this article has been to highlight some of the agency problems that arise in structured finance transactions, in light of recent concerns regarding the incentives of the various players throughout the chain of the originate-and-distribute model of banking and to investigate the extent to which the market recognizes and addresses these problems. The particular focus has been on CLOs of leveraged loans, which are an interesting case in point due to their managed structures and the importance of CLOs in the recent private equity boom as willing buyers of leveraged loans.

The article has demonstrated that agency problems do matter in CLO management, and it has highlighted the different dimensions in which these problems may occur. It has also described the various constraints that have emerged in the market to limit potentially adverse manager actions. These constraints, or mechanisms, address the major issues of the agency conflict and, generally speaking, should be expected to be fairly effective. However, there are still some gaps which may allow managers to engage in certain adverse strategies.

First, the overall reliability of certain portfolio tests has not yet been fully tested in tough market conditions. Specifically, there have been concerns about the reliability of estimates of the risk associated with certain loan types and of loan bucket specifications. These tests may have allowed some scope for excessive risk taking, and the problems may only surface once defaults begin to increase significantly.

Second, reputational constraints are not waterproof: they may not have been fully effective because of the extremely favourable market conditions in the years preceding the credit turmoil of 2007/2008, and they may also not have provided managers with sufficient incentives to invest in workout capacities. Furthermore, new managers may have had incentives to push risk taking to the limits of what was formally allowed.

There is also some uncertainty surrounding the desirability of retaining a portion of the equity tranche. Although there is no general requirement for managers to do so, they frequently buy/hold a portion of the equity tranche of some transactions. It is still subject to debate whether retention of the equity tranches has an effect on CLO performance and whether the market correctly recognizes instances, or CLO transactions, where retention is desirable.

Ultimately, the market and events will judge whether CLOs have been structured and managed in a prudent manner. Market conditions characterised by rising default rates and below par loan prices in the secondary leveraged loan market may well provide such a litmus test for CLO managers.

6. REFERENCES

- Adolph A. Berle & Gardiner C. Means (1932), "The Modern Corporation and Private Property," *The Macmillan Company* (New York).
- Michael C. Jensen & William H. Meckling (1976), "Theory of the firm: Managerial behavior, agency costs and ownership structure," *Journal of Financial Economics*, vol. 3(4), pages 305-360.
- Sanford J. Grossman & Oliver D. Hart (1986), "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration," *Journal of Political Economy*, vol. 94(4), pages 691-719.
- Oliver D. Hart (1988), "Incomplete Contracts and the Theory of the Firm," *Journal of Law, Economics, & Organization*, vol. 4(1), pages 119-139.
- Oliver D. Hart (1989), "An Economist's Perspective on the Theory of the Firm," *Columbia Law Review*, vol. 89(7), pages 1757-1774.
- Oliver D. Hart & John Moore (1990), "Property Rights and the Nature of the Firm," *Journal of Political Economy*, vol. 98(6), pages 1119-58.
- Oliver D. Hart (1995), *Firms, Contracts and Financial Structure*, Oxford University Press.
- Fitch (2006), "Global Rating Criteria for Collateralised Debt Obligations," Credit Products Criteria Report, 18 October 2006.
- Fitch (2007a), "CDO Asset Manager Report Harbourmaster Capital Management Limited," 2 April 2007.
- Fitch (2007b), "CDO Asset Manager Report Prudential M&G," 12 June 2007.
- Fitch (2007c), "CDO Asset Manager Report Alcentra Limited," CDO Asset Manager Report, 2 August 2007.
- Fitch (2007d), "CDO Asset Manager Report Mizuho Investment Management (UK) Limited," 5 September 2007.
- Fitch (2007e), "Fitch's Approach to Rating Covenant-Light Loans and CLOs," Criteria Report, 28 September 2007.
- Fitch (2008a), "Proposed Rating Methodology for Corporate CDOs," Criteria Report, 4 February 2008
- Fitch (2008b), "Developments in the US Leveraged Loan and CLO Markets," Special Report, 7 February 2008
- Morgan Stanley (2006), "Structured Credit Insights," 2nd edition.
- S&P (2001), "CDO Manager Quality: A critical consideration," 2 October 2001.
- S&P (2002a), "Global Cash Flow and Synthetic CDO Criteria," 21 March 2002.
- S&P (2002b), "Rating Methodology for CDOs Backed by European Leveraged Loans," 14 August 2002.
- S&P (2002c), "Balancing Debtholder and Equityholder Interests in CDOs", 13 November 2002.
- S&P (2008), "Reviewing A Decade Of U.S. CLO Performance And Equity Returns", 14 January 2008.
- S&P, Quarterly Reviews of European CDOs of Leveraged Loans.
- S&P, Presale reports of European CLOs.

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